

102-CD-003-004

## **EOSDIS Core System Project**

# **Configuration Management Plan for the Science Data Processing Segment of the ECS Project**

April 2001

Raytheon Company  
Upper Marlboro, Maryland

# **Configuration Management Plan for the Science Data Processing Segment of the ECS Project**

**April 2001**

Prepared Under Contract NAS5-60000  
CDRL Item 002

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# Preface

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The Configuration Management Plan for the Science Data Processing Segment (SDPS) of the ECS Project is submitted as required by Data Item Description (DID) 102/MG1 for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) contract. This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to final contract acceptance. This document is under ECS contractor configuration control. Contractor approved changes are handled in accordance with the change control requirements described in the Configuration Management Plan for the Science Data Processing Segment. Changes to this document will be made by document change notice (DCN) or by complete revision.

The contractor's ECS Change Control Board (CCB) shall submit all changes to this document for consideration. Changes approved by the ECS CCB shall be submitted to ESDIS for final approval.

This document has been prepared in accordance with:

803-RD-025-001	Mod 86, ECS Restructure Proposal for Contract NAS 5-60000
423-10-21	ESDIS Project Configuration Management Procedures
423-10-21-1	Science Systems Program Control Management Board (SS PCMB) Configuration Management Plan (Level 3)

This document is under ECS Project configuration control. Any questions or proposed changes should be addressed to:

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# Abstract

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This plan describes the configuration management process by which all software, documentation, hardware, firmware and data for the ECS will be managed. It establishes policies, methodologies and procedures, organizations and change control boards. When processes identified by this plan are detailed further in ECS project instructions (PI) or work instructions (WI), the appropriate PI or WI is referenced.

Applicable to all ECS phases this plan describes how configuration change control, baseline management, audit management, and custom software configuration management will be performed throughout the development, test, maintenance and operations of the SDPS of the ECS Project.

**Keywords:** Baseline, CDMTS, Class I Change, Class II Change, CM, COTS, Configuration Change Board (CCB), Configuration Change Request (CCR), configuration control, Configuration Item (CI), Configuration Status Accounting, Deviation, Functional Configuration Audit (FCA), Physical Configuration Audit (PCA), Software Turnover Form (STF), Waiver.

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## **Abbreviations and Acronyms**

# 1. Introduction

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## 1.1 Identification of Document

This document is the Configuration Management Plan for the ECS Project. It is submitted as required by the Contract Data Requirements List (CDRL), Item 002, DID 102/MG1, for the EOSDIS Core System (ECS) contract. This document integrates the ECS Development phase plan with that for ECS Maintenance and Operations into one plan that is applicable throughout the system life cycle for the managing ECS configurations.

## 1.2 Scope of Document

This document is an update to the Science Data Processing Segment Maintenance and Operations Configuration Management as provided in 102-CD-002-003 for the ECS Project, January 2001.

Provisions of this plan apply to all documentation, software, hardware, and data, which will be supplied by Raytheon Systems Corporation (RSC) under the ECS contract.

This plan:

- Implements requirements from Mod 86, ECS Restructure Proposal for Contract NAS5-60000 (803-RD-025-001), ESDIS Project Configuration Management Procedures (423-10-21), hereinafter referred to as the ESDIS Plan, and Science Systems Program Control Management Board (SS PCMB) Configuration Management Plan (423-10-21-1).
- Establishes all configuration management (CM) policies and methodologies relating to the ECS. It describes the ECS organization(s) responsible for planning and implementing the ECS CM process and the relationships between the ESDIS Configuration Control Board (CCB) and the contractor's development Change Control Boards (CCB). [NASA's convention is Configuration Control Board. ECS Project convention is Change Control Board.] In addition, this Plan defines the processes by which ECS configuration control, configuration verification (to include configuration identification, status accounting and auditing), and custom software CM will be accomplished.

This document describes configuration management processes at a summary level and references appropriate project instructions (PI) and Work Instructions (WI) that are regularly maintained to ensure continuous process improvement. This document reflects the changes to improve its level of support to the ECS program within the Configuration Management Office. This plan is binding on all ECS Project subcontractors.

## **1.3 Purpose**

The purpose of this plan is to describe the process by which ECS shall manage SDPS configurations throughout the life cycle of the project. This document describes the existing and planned processes for managing and providing status of the ECS science system. This plan, and subordinate Project Instructions and Work Instructions, implement the tasks contained in the ECS contract SOW and the configuration management requirements set forth in the ESDIS CM Procedures.

## **1.4 Document Organization and Relationships**

### **1.4.1 Organization**

Except as described below, the format and contents of this document comply with NASA-DID-M600 and NASA-DID-999 as defined in NASA-STD-2100-91. Additional paragraphs and subparagraphs have been added in sections as appropriate to their volume and contents.

- Introduction — provides the scope, purpose, objectives, status, schedule, and document organization.
- Documentation — provides a listing of parent, applicable, and reference documents.
- Configuration Management Process — provides an overview of the CM responsibilities (derived from the ESDIS Procedures), outlines the CM organization to address these responsibilities, and describes the tools used to assist the management of ECS configurations. This section also discusses the overall Project life cycle activities of the office.
- Configuration Change Control — describes the Project's plans for configuration control, to include the CCB structure, configuration change request (CCR) process, change control implementation and documentation, and configuration status accounting.
- Baseline Management — describes the Project's plans for configuration identification, and baseline documentation maintenance
- Audit Management – assures the integrity of the physical configuration, referred to as Physical Configuration Audits (PCA) and the functional configuration, referred to as Functional Configuration Audits (FCA).
- Custom Software CM — describes the Project's plans for custom software CM.
- Abbreviations and Acronyms — contains an alphabetized list of the definitions for abbreviations and acronyms used in this volume.

### **1.4.2 Documentation Relationships**

This Plan's principal parent document within the Project is the ECS Project Management Plan (101-CD-001).

The Data Management Plan for the ECS Project (104-CD-001) is a companion document to this plan. It describes the methodology for providing data management (DM) services necessary to create, control, deliver, archive, and update deliverable and non-deliverable documents and data; and to organize and provide easy access to these documents and data.

Specific details for both CM and DM are furnished to providers and users of CM and DM services in the form of PI and WI. In order to simplify maintenance of individual instructions and to facilitate distribution to users, each PI or WI will be treated as a stand-alone document. Accordingly, this plan refers to specific CM and DM PI and WI that will be improved and reissued as necessary to ensure continuous process improvement. Other PIs, and WIs, may be prepared and implemented if needed.



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## 2. Documentation

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### 2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

803-RD-025	Mod 86, ECS Restructure Proposal for Contract NAS5-60000
423-10-21	ESDIS Project Configuration Management Procedures
423-10-21-1	Science Systems Program Control Management Board (SS PCMB) Configuration Management Plan (Level 3)

### 2.2 Applicable Documents

The following documents are directly applicable to this plan to the extent referenced herein. In the event of conflict between any of these documents and this plan, the plan shall take precedence.

104-CD-001	Data Management Plan for the ECS Project
193-105-MG3	Data Management Procedures for the ECS Project
194-201-SE1	Systems Engineering Plan for the ECS Project
305-CD-500	Release 5A Segment/Design Specification for the ECS Project
308-CD-001	Software Development Plan for the ECS Project
334-CD-510	Science Systems Release Plan for the ECS Project
409-CD-500	ECS Overall Acceptance Test Plan for Release 5A
601-CD-001	Maintenance and Operations Management Plan for the ECS Project

### 2.3 Reference Documents

MIL-STD-973	Configuration Management
ANSI/EIA-649-1999	National Consensus Standard for Configuration Management
IEEE Std 828-1998	IEEE Standard for Software Configuration Management Plans

#### 2.3.1 ECS Baseline Information System (EBIS)

Current list of ECS Technical Documents is maintained on Internet using the following URL: <http://Pete.hitc.com/baseline/> and the mirror site (outside the ECS Firewall) <http://cmdm.east.hitc.com/baseline/index/>.

### **2.3.2 ECS Project Instructions**

Current list of ECS Project Instructions is maintained on Internet using the following URL:  
[http://dmserver.gsfc.nasa.gov/proj\\_instr/pi\\_index.html](http://dmserver.gsfc.nasa.gov/proj_instr/pi_index.html).

### **2.3.3 ECS Work Instructions**

Current list of ECS Work Instructions is maintained on Internet using the following URL:  
[http://dmserver.gsfc.nasa.gov/proj\\_instr/wi\\_index.html](http://dmserver.gsfc.nasa.gov/proj_instr/wi_index.html).

## 3. Configuration Management Process

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This section provides an overview of the ECS Project's CM responsibilities (as found in the ESDIS Project CM Procedures), a description of the ECS Project's CM organization to satisfy these requirements, and descriptions of the tools used to assist ECS configuration management.

### 3.1 CM Responsibilities

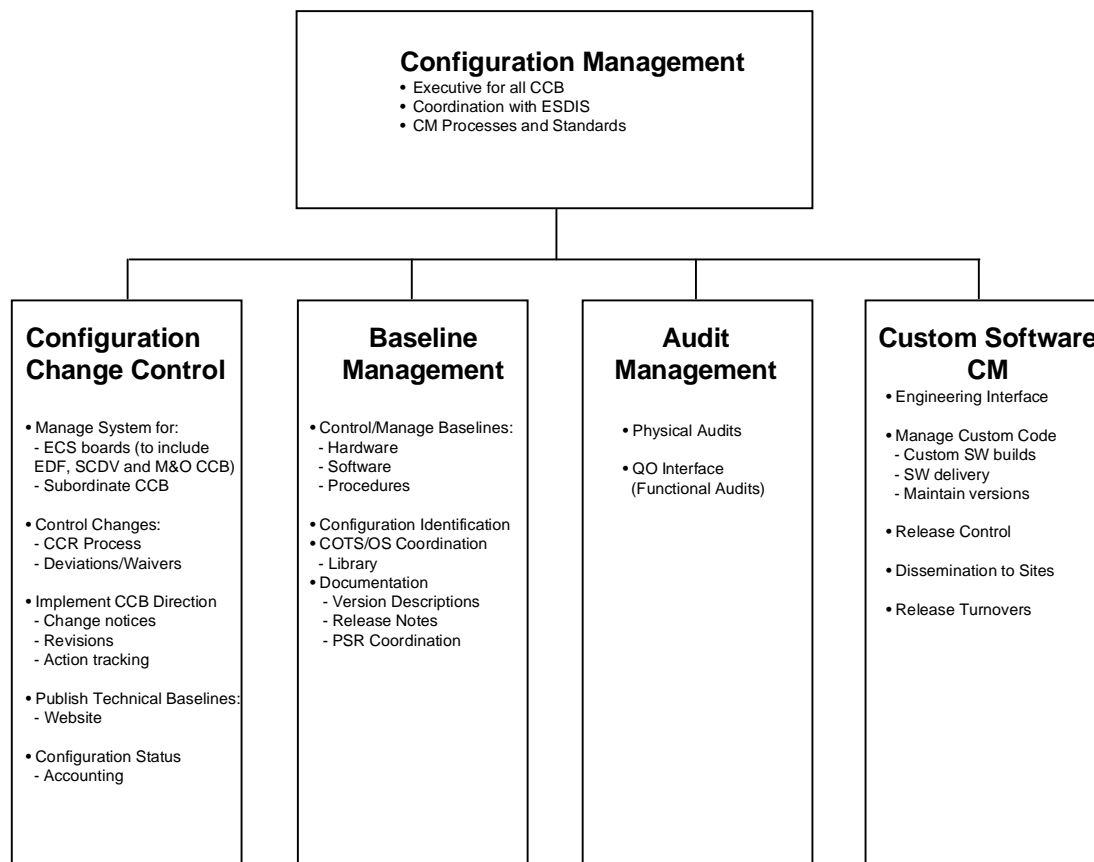
In accordance with the ESDIS Project CM Procedures the ECS Project has the following responsibilities:

- Implement and manage a configuration management process, to include:
  - Configuration Identification
  - Configuration Control
  - Configuration Status Accounting
  - Configuration Auditing
- Provide for system-wide configuration control
- Maintain the configuration of system documentation, hardware, and software for all project phases, including operations

### 3.2 CM Organization

The ECS Configuration Management Office (CMO) is an activity of the ECS Systems Engineering Office, which reports directly to the ECS Project Management.

ECS CM includes four functions: Configuration Change Control, Baseline Management, Audit Management, and Custom Software CM. These functions are summarized in Figure 3-1 Processes and procedures used for CM are explained in subsequent sections of this plan.



**Figure 3-1. CM Responsibilities**

### 3.3 Development Configuration Management Tools

This section provides a description of the Configuration Management (CM) tools that support the ECS software development. The CMO Manager controls the CM tools. Proposed changes to CM tools, or their application, are coordinated among the ECS/SCDV CCB membership before they are implemented.

Additionally, the CM tools support the collection of CM-related metrics.

- Identification and resolution of configuration problems (e.g. Engineering Change Order (ECO's).
- CCB review and approval of changes to the operations baselines (e.g. CCR listings and progress reports, CCB agendas and minutes).
- Progress for releasing and development of configuration changes (e.g. ECO status reports, DCN status reports, and IPT Drop Matrix listings).
- ECS Configuration Baseline status (e.g. Approved/Shipped Changes, Installed Changes).

An overview describing the functionality and use for each available CM tools is provided.

*Configuration/Data Management Tracking System (CDMTS)* - The CDMTS provides the following functionality:

- Provides CCB agendas and minutes.
- Tracks all change requests, requests from GSFC for ROM Impact Analyses, deviations and waivers to closure.
- Controls implementation of document-change CCRs.
- Tracks document change status, versioning and deliveries.
- Tracks CCB action items to closure.
- Produces status accounting reports on change requests and documents.
- Produces action item reports.

*Verification Database (VDB)* – The VDB database system is a relational database, which is the repository for ECS requirements and verification data. For additional information on the Verification Database (VDB) see PI SE-1-023, Verification Database Change Control Process.

*Software Configuration Management Library (SCM)* - The SCM is supported and controlled by ClearCase™ an automated software tool. ClearCase™ manages multiple versions of evolving software components, tracks which versions were used in software builds, performs builds of individual programs or entire releases according to user-defined version specifications, and enforces site-specific development policies. This software tool supports the ECS development environment. This same software tool will be deployed to support M&O. Site-requirements and cost-benefit analyses were conducted to determine the tool's application within the M&O environment. For further details on the see CM-1-016-1, Software Development Using ClearCase.

The tool's specific capabilities permit:

- Developers to balance between sharing each other's work and isolating themselves from destabilizing changes. The tool manages the sharing and control of source, object, and executable files.
- Tracking of the software build process so that developers can determine what was built and how it was built. The tool also can instantly recreate the source base from which a software system was built, allowing it to be rebuilt, debugged, and updated without interfering with other programming work.
- Project administrators to define development policies and procedures, and automate their enforcement.
- Tracking of documentation as well as source elements. The tool supports the creation of new element types and the assigning of user-defined attributes to these types. Not only does this provide for recording of configuration items, with attributes, but also a chronological change history for each configuration item.

*XRP -XRP -II* and *ACCELL* and its companion database management system collectively serve as both the ECS Baseline Manager (BLM) and Inventory/Logistics/Maintenance Manager (ILM) software tools that are used in support of ECS configuration management. Baseline Manager provides the capability to baseline ECS software, hardware, hosts, disk partitions, and documentation and establishes a reference for what the operational system configurations "should be" at the operational sites as well as PVC and VATC. Currently baselined in XRP includes Commercial-Off-the-Shelf (COTS) software and O/S patches. (A primary purpose of the software baseline is to identify the software package, version, principal directory, and developer and map the software products to the appropriate site hosts.)

Baseline Manager catalogs version controlled items, call control items and maintains the product structure relationships among the items. It also maintains traceability and provides a change history of the baselines generated.

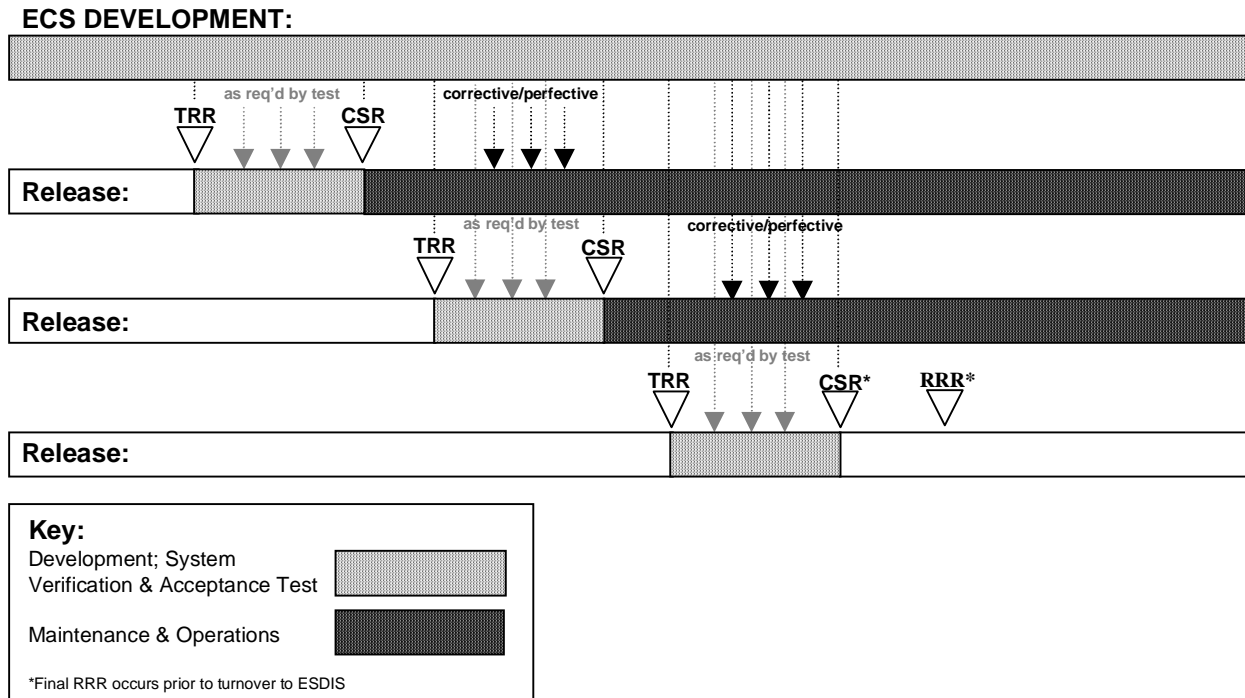
*DDTS™ (Distributed Defect Tracking Software)* - The ECS software Nonconformance Reporting and Corrective Action (NRCA) system utilizes the *DDTS™* software tool by Pure Software to record non-conformances. *DDTS™* has been customized by ECS to accurately reflect the process for resolution of Nonconformance Reports (NCRs) by the NRCA system (see PI SD-1-014, Nonconformance Reporting). Through the production of management reports, *DDTS™* provides management visibility and metrics to insure that NCRs are being worked in a timely and effective manner.

*EASI (ECS Assistant System Installer) Emulator* - This tool provides the mechanics for automatically generating the 920-TDx-019 series of Technical Documents. Known as the Real Time Delivered Custom Software Baseline, these documents show what versions of all of the custom code files should exist on all the sites' hosts, for all the modes. The tool generates the metadata for the custom files, and overlays any patches, known as Test Executables, onto the Tech Docs. As the authorizing CCR number is included in the metadata, the 920-TDx-019 series of Tech Docs will track any Test Executables. This data is used routinely as an audit reference during Custom Code auditing.

### **3.4 CM Activities throughout the ECS Life Cycle**

Configuration Management activities are pervasive throughout the ECS life cycle. From program initiation until final release and turnover to the Government, change control, auditing and custom code configuration management are integral to program management activities. As releases are developed, CM provides required support. When release responsibility transitions to M&O, CM continues to provide support, including managing corrective or "perfective" changes approved by the M&O CCB. When a baselined version has been replaced by a newer version, CM assures that this action is properly recorded in documentation and records. CM activities are shown schematically at Figure 3-2 and are explained in detail in the succeeding sections of this plan.

Note that the basic processes and procedures for CM remain the same, regardless of the phase of the project.



**Figure 3-2. ECS/SPDS Development Life Cycle**

Vertical arrows reflect the flow of system changes from Development to Test or M&O. Changes may be COTS hardware, COTS software (to include operating system patches), or custom code and are “turned over” to test or to sites after undergoing a Pre-Ship Review (PSR), which has determined the readiness of the configuration change for delivery. When ECS management determines that the required functionality has been attained, a Consent-to-Ship Review (CSR) is held to determine the readiness of the release to transition to sites for installation testing. The CSR defines the state of the release, the ECS recommended position on release maturity, request ESDIS approval to install at site(s), and establishes a new system baseline for the release. The control of new system baselines is the responsibility of the ECS CCB and the ECS Development Facility (EDF)/Science and Development (SCDV) CCB until CSR. The control of the new baselines after CSR is the responsibility of the M&O CCB.

New versions of the system configuration baseline accompany new ECS System Releases. The changes result from changed requirements and/or functionality. As approved by CCB, changes are recorded in the appropriate baseline documentation.

The process of configuration changes continues throughout the life cycle of the project until ECS is ready for turnover to ESDIS. The final turnover will be accomplished at the Release Readiness Review (RRR) for the ECS Project.



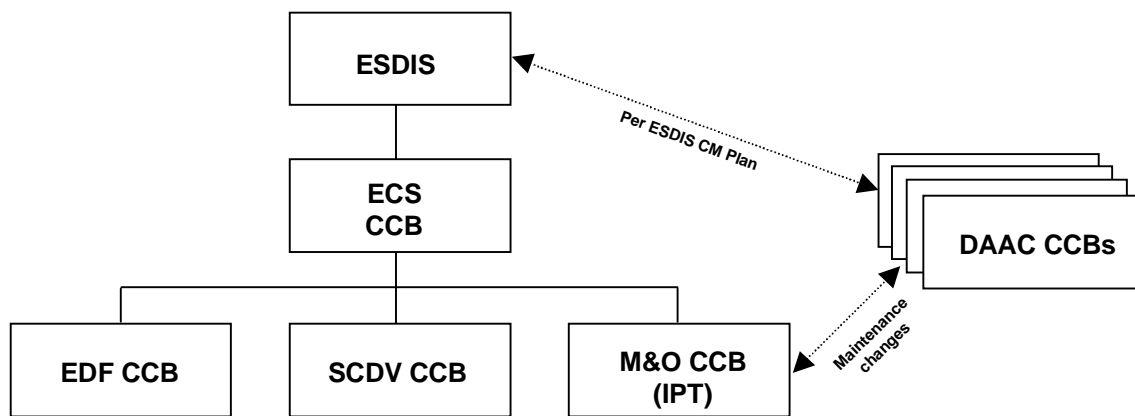
## 3.5 CM Functions

### 3.5.1 Management

The Configuration Manager directs all activities of the ECS CM offices and represents ECS in coordinating with ESDIS counterparts on all matters relating to the managed configurations. In addition, he/she supervises all activities of the various ECS configuration control boards, and assures that this CM plan, processes and standards are implemented.

### 3.5.2 Configuration Change Control

Definition and management of change control processes for all CCBs are the responsibility of the ECS CM. CM also provides tools, training and verification to implement the processes for all CCBs. CM provides administration and status accounting for the ECS board. Each CCB administration maintains a standard membership and distribution list. Agendas and proposed changes are forwarded to the distribution list in advance of meetings. Minutes and action items are recorded and open action items are tracked to closure. The overall hierarchy of ECS CCB is shown in Figure 3-3.



**Figure 3-3. Control Board Hierarchy**

Change control procedures are used for ECS baselines as the ECS is developed, integrated, and ultimately deployed to operational sites. After detailed specifications are approved and placed under formal configuration control, any change to the baseline is reviewed and approved by the responsible CCB before the baseline is revised. Change control also includes managing the implementation of CCB direction by change notices, revisions, and action tracking. All changes are integrated into ECS Baseline documentation. This includes documents that describe COTS hardware and software, custom software, firmware, operating systems, software patches and database items that are included as CI in the ECS Science System configuration baselines. The ECS Configuration Baseline may be changed by introduction of a new baseline associated with a new System Release at a CSR or through changes accompanying system patches at PSR. All baseline documents are published on the CM website once approved by the SCDV (pre-Release)

or M&O (post-CSR/RRR) CCB. Configuration Change Control is also responsible for the recording and reporting on managed items of the configuration (configuration status accounting). Configuration status accounting provides status reports to ECS Project management and ESDIS informing each of the evolving status of the configuration. CM posts on-line status information in the ECS Baseline Information System (EBIS) website. Reports to support reviews and audits are extracted as needed from this database.

DMO maintains status accounting information for each ECS document controlled by Project CCB. Information maintained includes records and reports, document change status and histories, milestone baselines, and change status. CM maintains configuration change status accounting information for each configuration change document (CCR, Waiver/Deviation) originated within the ECS Project. Historical records are maintained on each CI to provide a traceable path to previous configurations.

In addition CM develops status-tracking information to assist in the management of changes:

- Identification and resolution of configuration problems (e.g. Engineering Change Order (ECO's).
- CCB review and approval of changes to the operations baselines (e.g. CCR listings and progress reports, CCB agendas and minutes).
- Progress for releasing and development of configuration changes (e.g. ECO status reports, DCN status reports, and IPT Drop Matrix listings).
- ECS Configuration Baseline status (e.g. Approved/Shipped Changes, Installed Changes).
- Auditing of the operations configuration baselines (e.g. discrepancy metrics/reports reflecting differences between the approved and installed baselines in both the testing environment in the Verification and Acceptance Test Center (VATC) and at the DAAC).

### **3.5.3 Baseline Management**

Baseline Management includes managing the identification and documentation of the functional and physical requirements of a system (configuration identification). CM establishes procedures to identify the configuration and to assure that all baseline documentation complies with them. This process ensures that, when delivered, later releases contain all of the applicable fixes and improvements that had been incorporated into predecessor release(s).

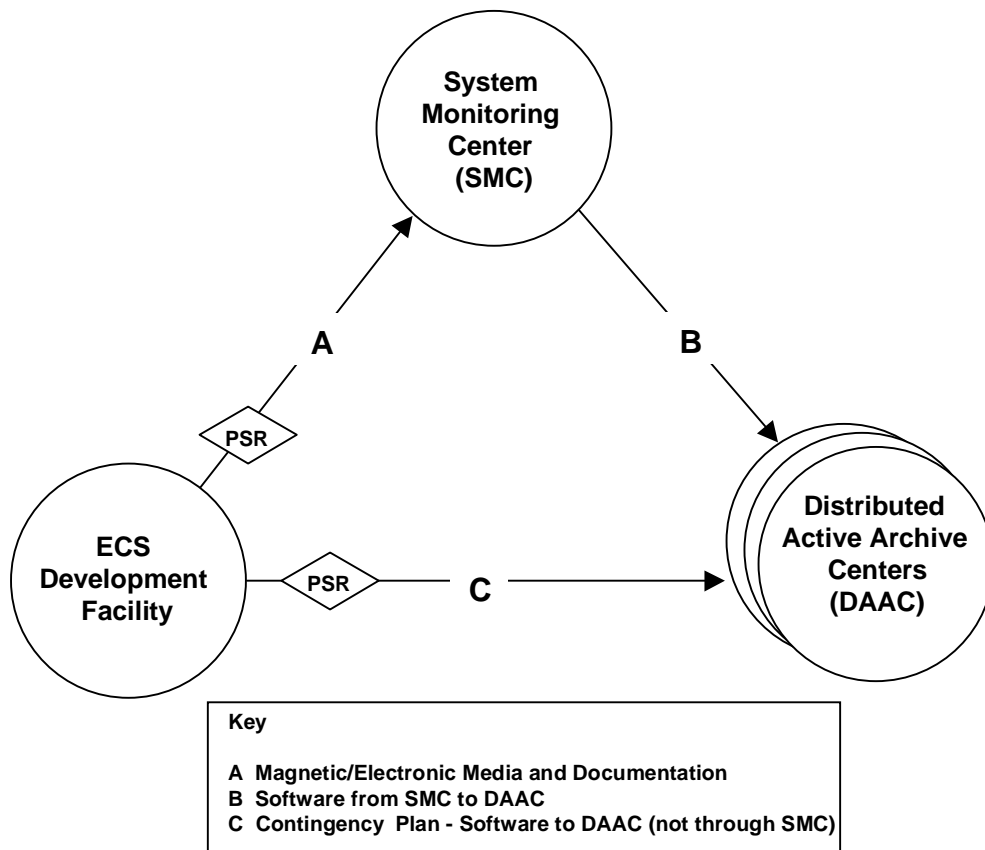
### **3.5.4 Audit Management**

Audit Management includes auditing the physical configuration of each release against its technical documentation to verify the configuration item's release baseline. Configuration audits are conducted to assure the integrity of the physical configuration and referred to as Physical Configuration Audits (PCA) and the functional configuration, referred to as Functional Configuration Audits (FCA).

### 3.5.5 Custom Software CM

Custom Software CM maintains and controls the central repository for custom software files, manages the ClearCase developmental environment, oversees implementation of software versioning, and performs nightly code merges.

When ECS management directs full version releases, CM assembles, and delivers electronic media and documentation to ECS Contracts for subsequent delivery to ESDIS. In parallel, electronic transfers of software take place between CM and the SMC for retransmission to the DAAC (path A of Figure 3-4). Upon receipt SMC makes the delivered software available to sites (path B) for downloading. In the event an electronic transfer is not possible, ECS management may approve the delivery of magnetic media directly to a site (path C). In either case, custom code (full version release or patches) is released to SMC and DAAC only after PSR.



**Figure 3-4. Electronic Transfer of Custom Code at Release**

## 4. Configuration Change Control

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Configuration change control is the systematic proposal, justification, evaluation, coordination, approval or disapproval of proposed changes to a baseline and the implementation of all approved changes in the configuration of an ECS hardware, firmware, and software (COTS and custom code) after the configuration items have been baselined.

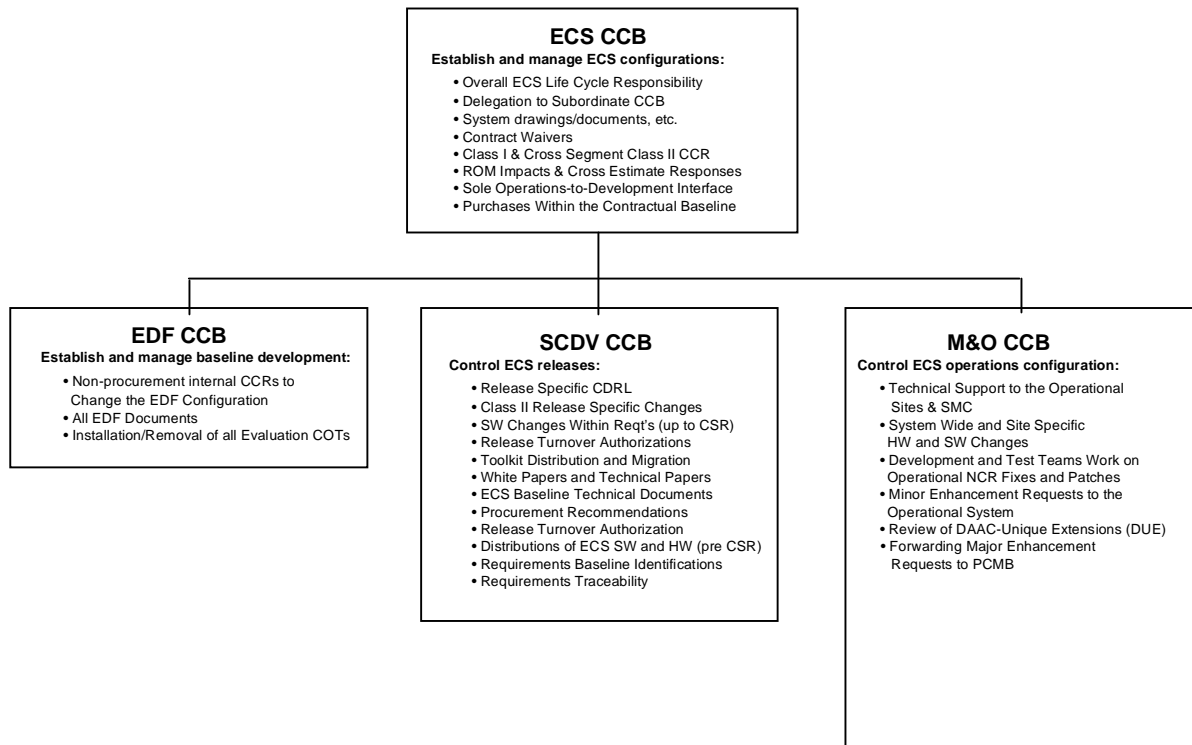
The objective of ECS configuration change control is to ensure that:

- Changes are adequately defined, assessed for technical, cost, and schedule impacts by the ECS office(s), and formally considered by the appropriate CCB.
- Only approved changes are incorporated in the appropriate baseline in an orderly and systematic manner.
- Actions assigned by each CCB are monitored and brought to closure. These consist of:
  - ECO reflecting direction to change design
  - DCN reflecting direction to change documentation.

The following paragraphs describe the configuration change control responsibilities and activities to be used in controlling, maintaining, and implementing changes to ECS baselined products.

### 4.1 ECS Change Control Boards (CCB)

ESDIS ECS CM consists of a hierarchy of boards that control the configuration. The hierarchical concept of ESDIS ECS boards is shown in Figure 4-1.



**Figure 4-1. Responsibilities of ECS Boards**

#### 4.1.1 ESDIS CCB

The ESDIS CCB, a Level 2 board, is responsible for:

- Interfacing with higher-level boards for changes that affect Level 1 requirements
- Controlling Level 2 requirements
- Approving specified documentation
- Procurements

Specific responsibilities of this Board and details of the ESDIS Change Control process can be found in 423-10-21, Earth Science Data and Information System Project Configuration Management Procedures and 423-10-21-1, Science System Program Control Management Board (SS PCMB) Configuration Management Plan (Level 3).

#### 4.1.2 ECS CCB

The ECS CCB is responsible for establishing and managing the configured baseline(s) of the project.

Additional responsibilities of this board are:

- Overall ECS Life Cycle responsibility

- Delegation and allocation of authority and responsibility to subordinate CCB
- All ECS system drawings/documents, Acceptance Test requirements, preliminary IRD, internal and external ICD, inter-segment ICD and any other non-release specific documents per 152-TR-001, ECS Document Control Matrix
- Contract Waivers
- All Class I CCR (enhancements with cost/schedule impact)
- All Cross-Release or Cross-Segment Class II CCR
- Requirements baseline identifications for both internal and customer-driven milestones
- All purchases with project funds that are within the contractual baseline

The ECS CCB meets on a regular schedule and may be convened for emergency meetings as required by the Chairman. The ECS CCB is chaired by the ECS project manager's designee and may be composed of the following:

Representatives from:	System Engineering
	Software Development
	Maintenance and Operations
	Science Data Engineering
	Information Technology Infrastructure
	Quality Assurance
	Data Management
CCB Administrator	CM

The minimum attendees required to support the ECS CCB are:

- ECS CCB chairman (or alternate)
- CCB Administrator
- Quality Assurance
- Sponsoring organization or originator of the change
- Data Management (for documentation changes only)

The CCB chairman or their alternate can sign Emergency CCRs out of board if the CCRs are complete in all other respects. Such out of board CCRs are to be included in the agenda of the next scheduled board meeting.

It is the members' responsibility to ensure that all internal and external impacts are identified and addressed. The organization sponsoring a change request is responsible for addressing technical, cost and schedule issues before the meeting and for completing actions assigned by the CCB chairman, and attending site technical review and CCB meetings as requested. Government representatives may attend ECS CCB meetings at their option to verify process or exchange information.

### 4.1.3 Lower-Level ECS CCB

The ECS CCB charters and directs lower-level CCBs. Project CCBs: For additional information regarding charters and allocations of project CCBs refer *to "Allocation of Authority and Responsibility"* (152-TR-001) and PI CM-1-004, CCB Change Control Process.

#### 4.1.3.1 EDF CCB

The EDF CCB is responsible for establishing and managing baseline development, to include:

- Controlling developmental configurations
- Recommending EDF procurements to the ECS CCB
- Approving all non-procurement internal CCR to change the EDF configuration, COTS hardware/software, networks, facilities, related procedures.
- Controlling all EDF documents
- Installation/removal of all evaluation COTS in the EDF

Emergency meeting of the EDF CCB may be called to address health and safety issues, disaster response, calls to emergency response teams (fire, police, etc.), matters requiring system emergency shut-down or maintenance, or exercise of pre-approved contingency plans.

Project instructions regarding the EDF Change Control process can be found in PI CM-1-004, CCB Change Control Process. Policies and responsibilities for the administration and configuration control of the EDF can be found in WI CM-1-004-1, CCR Submittal and CCB Meeting Preparation.

A representative appointed by the Manager, Information Technology Infrastructure, chairs the EDF CCB. The membership may be composed of:

Representatives from:    System Engineering  
                                     Software Development  
                                     Maintenance and Operations  
                                     Science Data Engineering  
                                     Quality Assurance

CCB Administrator        CM

The minimum attendees required to support the EDF CCB are:

- EDF CCB chairman (or alternate)
- CCB Administrator
- Quality Assurance
- Sponsoring organization or originator of the change

The CCB chairman or their alternate can sign Emergency CCRs out of board if the CCRs are complete in all other respects. Such out of board CCRs are to be included in the agenda of the next scheduled board meeting.

CCB members are responsible for ensuring that all impacts are identified and addressed. The organization sponsoring a change request is responsible for addressing technical, cost and schedule issues before the meeting and for completing actions assigned by the CCB chairman, and attending site technical review and CCB meetings as requested.

#### **4.1.3.2 SCDV CCB**

The SCDV CCB has the responsibility for controlling ECS releases. It meets on a regular schedule to consider:

- Controlling the configurations of the test environments (VATC, and PVC)
- Authorizing:
  - Segment turnovers
  - Toolkit distribution and migration
- Approving:
  - Release-specific CDRL documents and others per 152-TR-001, ECS Document Control Matrix
  - Class II release-specific changes
  - At Chair's option, drafts (including ECS CCB-controlled documents), white papers, and technical papers.
  - ECS Baseline Technical Documents
  - Distributions of ECS software and hardware outside of the ECS Development Facility for use within the ECS project prior to CSR. (All other distributions require Raytheon Contract Office authorization.)
- Recommending VATC, and PVC procurements to the ECS CCB that are within the contractual baseline
- Assuring Requirements Traceability of:
  - Level 3 Requirements to IRD mapping
  - Traceability of L3 to L4s
  - Test Information
  - Mapping of Acceptance Test to Requirements

The SCDV CCB is chaired by a representative appointed by the Manager, System Engineering. The membership may be composed of:



Representatives from:   Software Development Maintenance  
  and Operations (as required)  
  Science Data Engineering  
  Information Technology Infrastructure  
  Quality Assurance

CCB Administrator       CM

The minimum attendees required to support the SCDV CCB are:

- SCDV CCB chairman (or alternate)
- CCB Administrator
- Quality Assurance
- Sponsoring organization or originator of the change
- Data Management (documentation changes only)

The CCB chairman or their alternate can sign Emergency CCRs out of board if the CCRs are complete in all other respects. Such out of board CCRs are to be included in the agenda of the next scheduled board meeting.

CCB members are responsible for ensuring that all impacts are identified and addressed. The organization sponsoring a change request is responsible for addressing technical, cost and schedule issues before the meeting and for completing actions assigned by the CCB chairman, and attending site technical review and CCB meetings as requested.

#### **4.1.3.3 M&O CCB**

Maintenance and Operations (M&O) CCB controls ECS science system operations baselines after Release 4 RRR and subsequent CSR.

The M&O CCB is charged with two major responsibilities:

- Provide technical support to the operational sites and the System Monitoring Center (SMC), identification of change requests as a bug fix or a system enhancement needing higher level authorization.
- Approve and track system-wide and site-specific hardware and software changes to the system operations baseline. This includes control the system baseline through the active participation of the EDF, SCDV and SMC CM organizations.

The M&O CCB has authority for:

- Controlling Distributions of ECS software and hardware outside of the ECS Development Facility for use within the ECS project after CSR. (All other distributions require Raytheon Contract Office authorization.)
- Authorizing Development and Test Teams work on CCR fixes and patches
- Approving minor enhancement (“perfective”) requests to the operational system
- Recommending DAAC/SMC procurements to the ECS CCB
- Reviewing DAAC sponsored DAAC-unique extensions (DUE) to the ECS operational system. The DUE is reviewed for potential impact to ECS systems and for consideration of future inclusion into the ECS system.
- Forwarding major enhancement requests to the appropriate higher level board.

The M&O CCB meets on a regular schedule to:

- consider proposed changes to the DAAC and SMC, M&O and ECS operational configuration,
- IPT Team,
- Development and Test team work on CCR fixes and patches,
- shipment of patches to the SMC,
- minor enhancement requests to the operational system.

M&O CCB responsibility begins upon release to Operations and Maintenance, which occurs at CSR. At this time the M&O CCB will consider all major enhancements to an operational baseline and forward that request, with recommendation, to the Program Configuration Management Board.

Project instructions regarding the M&O Change Control process can be found in PI MO-1-003, Sustaining Engineering and Maintenance Management and WI MO-1-003-4, ECS Deployment IPT Work Instruction.

A representative appointed by the M&O Manager chairs the M&O CCB. The membership maybe composed of:

Representatives from:	DAAC (EDC, GSFC, LaRC, and NSIDC)
	SMC
	System Engineering
	Software Development
	SCDV CCB
	Quality Assurance
CCB Administrator	CM

The minimum attendees required to support the M&O CCB are:

- M&O CCB chairman (or alternate)
- CCB Administrator
- Quality Assurance
- Sponsoring organization or originator of the change

The CCB chairman or their alternate can sign Emergency CCRs out of board if the CCRs are complete in all other respects. Such out of board CCRs are to be included in the agenda of the next scheduled board meeting.

CCB members are responsible for ensuring that all impacts are identified and addressed. The organization sponsoring a change request is responsible for addressing technical, cost and schedule issues before the meeting and for completing actions assigned by the CCB chairman, and attending site technical review and CCB meetings as requested.

#### **4.1.3.4 Schematic**

Responsibilities of the various ECS boards are shown in Figure 4-1.

## **4.2 Control Changes**

### **4.2.1 Change Classes**

Class I and Class II changes are defined in the ESDIS Project Configuration Management Procedures (423-10-21), and are determined by the technical or contractual content of the change.

Class I change is an out-of-contract scope change that affects the form, fit, or function of the ESDIS Project CCB controlled items in one or more of the following ways:

- The technical baselines and the System Specification
- Configuration Items (CI) as specified in the contract.
- Technical requirements.
- Non-technical contractual provisions, to include:
  - Contract cost and fee
  - Schedules
  - Deliverables
- Other factors. To include:
  - Government-furnished equipment (GFE)
  - Compatibility with support equipment and training devices/equipment

— Configuration to the extent that retrofit action would be taken

- Class II change is an in-scope contract change that does not fall within the definition of a Class I change.

Changes which affect the ECS development facility (EDF) are classified as IN. These CCRs are used by Raytheon Technical Services Co. (RTSC) to track internal changes and assign work orders.

## **4.2.2 Change Requests**

### **4.2.2.1 Configuration Change Request**

All requests for change are documented using a CCR. A CCR contains a problem description, operations impact, recommended priority, proposed configuration change and/or solution, sites affected, and lists the CI and affected documentation. CCRs are generated against the data base, document/drawing or software/hardware product affected by the proposed change. These requests are submitted to the appropriate CCB for consideration as described in this plan. The CCR is also used for deviations and waivers as described in CM-1-006.

### **4.2.2.2 Submission of CCR**

Changes are implemented only after completion and approval of a change request generated against the product's technical documentation. Assignment of changes to a Release is the responsibility of the Construction Office. All changes will indicate "need date" and will only be approved when it is determined that necessary resources are in place to implement the change by that date.

All change requests are submitted to the appropriate CCB administrator using the CCR and an attached change definition package defining the proposed changes to the applicable drawings or specifications. The organization originating the change request is responsible for providing the information required on the CCR Form and for defining the proposed changes to affected documentation.

CCRs are distributed by the CCB administrator and reviewed for technical, cost, and schedule impact on a scheduled basis by the appropriate CCB. Special CCB meetings are scheduled as required to consider emergency change requests. Impacts, including those from subcontractors, are reviewed at the CCB meeting and CCB Chairman has final approval/disapproval authority. For Class II changes, the CCB Chairman's approval constitutes authorization to implement the change.

The ECS CCB has sole authority for approval and submittal of Class I changes. Upon approval by the ECS CCB, the CCR is forwarded to the ESDIS CCB as a recommendation. Approval by the ESDIS CCB does not constitute authorization for the contractor to implement changes. The contractor must receive contractual direction to implement any Class I change.

#### **4.2.2.3 CCB Proceedings**

Configuration change control reviews all incoming CCRs for completeness and correctness. The CCR is then entered into CDMTS, assigned a CCR number, and scheduled for the appropriate CCB. At the CCB the CCR is dispositioned in accordance with PI CM-1-004, CCB Change Control Process. The CCB Chairman may assign additional actions required to close this CCR as part of board proceedings. All CCB direction is recorded as a part of CCB proceedings. ECOs and DCNs are employed to record board direction.

#### **4.2.2.4 Request for Deviation or Waiver**

Requests for deviations or waivers are initiated using the CCR form as a cover sheet for the deviation or waiver form. These requests are reviewed by the ECS CCB and submitted to the ESDIS CCB for approval. Instructions for preparing and controlling deviations and waivers are described in PI CM-1-006, Configuration Control - Deviations and Waivers.

### **4.3 Implementation of CCB Direction**

The following paragraphs summarize the principal CM-related forms and documents that are used in the ECS CM process. Forms and other process documentation are revised whenever needed to support continuous process improvement.

#### **4.3.1 Document Change Notices and Histories**

All CCB-approved changes and revisions to configuration controlled documentation are implemented by Document Change Notices (DCN). As DCN are incorporated into documents a history log is updated in the front of the document to define the current configuration of the document in accordance with NASA Specification 500-TIP-2110. DCNs are issued via a transmittal memo. Details for preparation and submittal of DCN are included in PI DM-1-004, CDRL Item/ Required Documentation Generation, Review, Release, and Maintenance.

#### **4.3.2 Document Revisions**

Revisions will include any changes necessary to bring the document up to date, incorporation of DCN, and other actions specified by the CCB. Revisions will be forwarded to the CCB along with details on changes made to the baselined document as a result of the revision. Once approved by the CCB, the document will be posted to the ECS baseline.

#### **4.3.3 Document Action Tracking**

Open CCRs and any action assigned by the CCB (to include ECO and DCN) are tracked by Configuration Change Control by suspense date. The CCB will routinely review these to assure actions are completed by the required date and are closed appropriately.

## **4.4 Configuration Change Documentation**

CM regularly records information on CCBs, CCR dispositions, action items, and Engineering Change Orders (ECOs) using the following website: <http://dmserver.gsfc.nasa.gov/CCB-BB/ECS/CCB-BB.html> and <http://m0mss01.ecs.nasa.gov/smc/>.

## **4.5 Configuration Control Support Activities**

### **4.5.1 Nonconformance Reporting and Corrective Actions (NRCA) System (Development and SVAT Phases)**

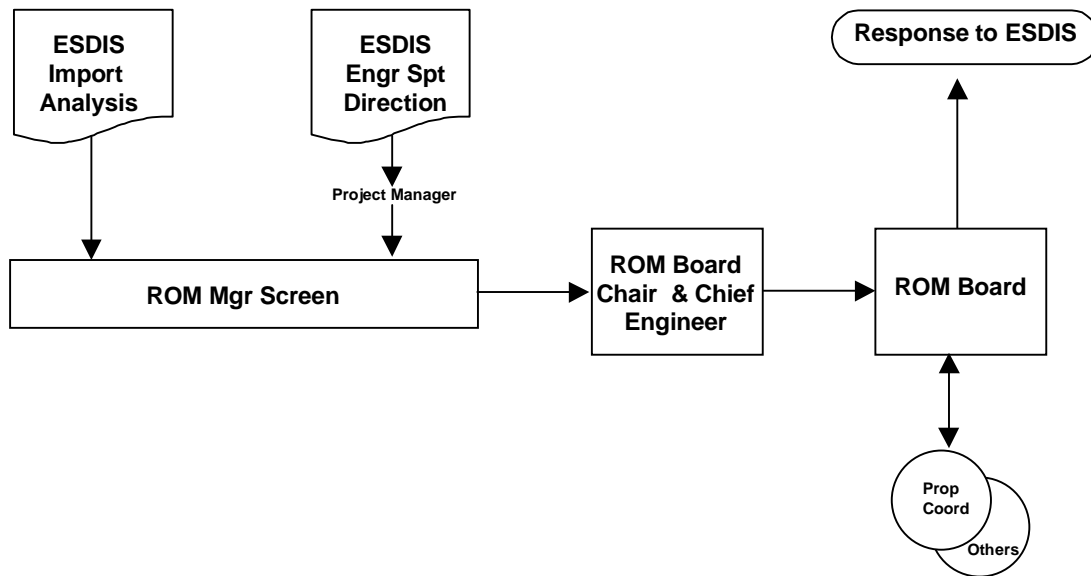
NRCA system is used to identify, investigate and resolve software, hardware and related documentation problems during Development and SVAT. The NCR Review Board, comprised of appointed representatives from all functional areas and offices manages the system. Configuration change control provides administrative support to this board and ensures that all nonconformances have been recorded, assigned to appropriate actionee(s), and are being dispositioned. The NCR Board process is explained in PI SD-1-014, Non-Conformance Tracking and PI SD-1-026, COTS SW Problem Resolution Procedures.

The ECS person who identifies a discrepancy creates a NCR. This activity is described in WI SD-1-014-1, Release Development NCR Process.

The NRCA system is used to support resolution of the nonconformance in a timely and responsible manner with adequate records to document the process. The NCR Board reviews each new NCR. The subsystem lead or other designee assigns the NCR to the appropriate actionee.

### **4.5.2 Rough Order of Magnitude (ROM) Board**

ECS receives requests from ESDIS for ROM impact analyses of ESDIS CCR. Once received these are directed to the ECS ROM Manager and processed in accordance with PI PM-1-009, CCR ROM Process, PI PM-1-010 Engineering Support Directive Process, and PI PM-1-011, Technical Directive Process.. CM provides administrative support to this board and ensures that all actions are recorded, assigned, and dispositioned. The process is shown schematically at Figure 4-2.



**Figure 4-2. ROM Impact Analyses**

#### **4.5.3 Deployment Integrated Product Team (IPT) (Development, SVAT, and M&O Phases)**

During the Development and SVAT phases the NCR Board (see paragraph 4.5.1) manages the work-off of non-conformances.

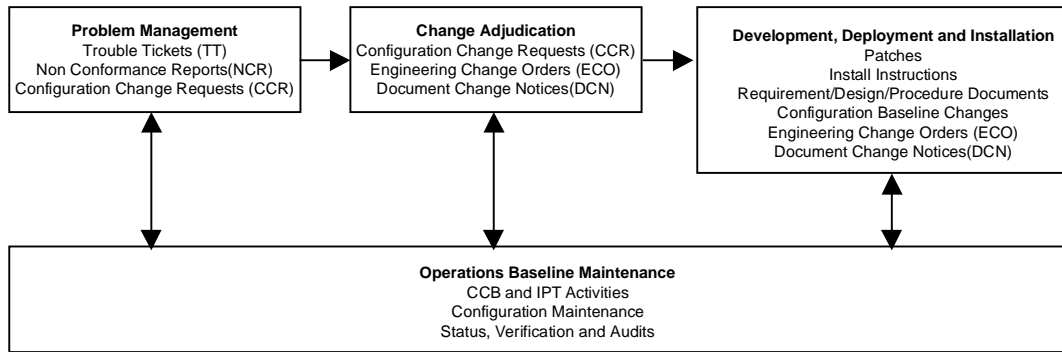
For the M&O phase a special team, the IPT, tracks NCR work-off and testing activity and prioritizes work that must be accomplished to test and verify the NCR. IPT proposes patch contents and schedule to the appropriate CCB.

#### **4.5.4 Trouble Ticket (TT) / Work-off of NCR (M&O Phase)**

CM also provides support to ECS Sustaining Engineering and Maintenance Management operations for Trouble Tickets that are being forwarded to ECS for resolution. Once entered into the NCR / ROM Board systems they are managed in accordance with paragraph 4.6.1. Specific responsibilities for Trouble Ticket (TT) / Work-off of NCR can be found in PI MO-1-003, ECS SDPS Sustaining Engineering and Maintenance Management and WI MO-1-003-4, ECS Deployment IPT Work Instruction.

### **4.6 Configuration Management after CSR/RRR**

The Maintenance and Operations (M&O) Configuration Management activities and the elements of each activity are shown schematically at Figure 4-3.



**Figure 4-3. M&O Configuration Management Activities.**

Subsequent paragraphs describe the activities of the change management system in more detail. For further detail, refer to PI or WI that are referenced.

Changes to the ECS Science System CI occur in the following forms:

- New versions of the system configuration baseline accompany ECS System Releases. The changes result from changed requirements and/or functionality.
- DAAC-unique changes to the ECS operations configuration approved by the ECS CCB/M&O CCB for incorporation in the ECS core configuration.
- Changes to the operations CI required to maintain the system might be “corrective” to repair residual flaws or “perfective” to improve the effectiveness, maintainability or performance of the current version of the operations configuration. Perfective maintenance changes or “routine enhancements” are those that meet each of the following requirements:
  - Not a change to a Level 3 requirement
  - Not a change to an external interface
  - Are within established ECS M&O budget
  - Do not unreasonably conflict with development Releases and implementation of “corrective” maintenance changes.

Review and approval of these maintenance changes are the responsibility of the M&O CCB and are delivered to operations through PSR.

The remainder of this section will describe the management of the maintenance corrective and perfective changes to the operations configuration baseline.

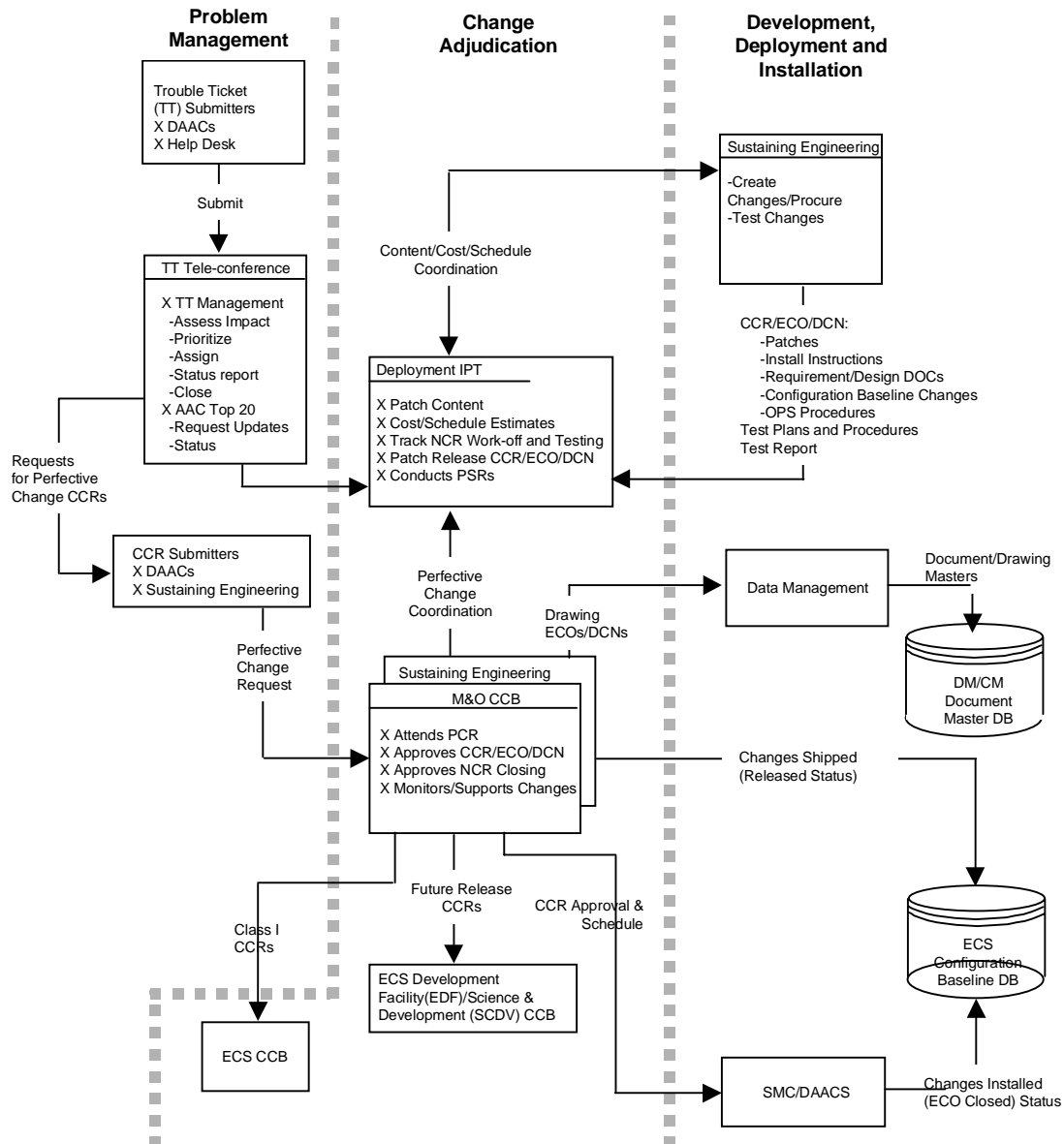
Figure 4-4 depicts the activities that are required to:

- Document, manage, resolve and report problems with the operational configuration.



- Propose, review and adjudicate corrective and perfective changes to the operations system configuration.
- Develop and deploy the configuration changes to operations.
- Maintain the operational baseline including approved/shipped and installed change statuses.

Paragraphs 4.6.1 through 4.6.4 discuss the CM change processes after CSR or RRR.



**Figure 4-4. Maintenance and Operations Change Management Process**

#### **4.6.1 Configuration Problem Management**

Problems (corrective or perfective) are documented in a trouble ticket database and submitted to the Trouble Ticket. The Tele-conference, with members from ECS maintenance and operations, ECS sustaining engineering, the SMC, and the DAACs, review the impact, assign an initial priority, and assign the problems for investigation. A more detailed description of these activities can be found in the PI MO-1-003, ECS SDPS Sustaining Engineering and Maintenance Management, WI MO-1-003-4, ECS Deployment IPT Work Instructions, WI MO-1-003-6, DAAC Help Desk Support, and WI MO-1-007-1, Problem Review Board.

#### **4.6.2 Configuration Change Adjudication**

The Deployment IPT includes the M&O CCB chairperson and members from ECS Maintenance and Operations, SMC, and DAAC. Using the results of the NCR Prioritization Team, the IPT tracks NCR work-off and testing activity. The IPT conducts the PSR for patches and reviews the patches with the receiving SMC and DAAC. The PSR includes a description of the system changes and associated documentation changes including the test results (as found during testing in the EDF facility). The operations procedure changes, configuration baseline changes (including database changes), and installation instructions are also part of the PSR.

CM will ship the patch to the SMC for distribution to the DAAC. At this point, baseline changes will be reflected in the ECS Baseline as shipped/released changes.

For problems that require perfective changes to the operational baseline, the M&O CCB reviews the CCR. If a perfective change CCR is approved by the M&O CCB, ECO and DCN will be recorded and assigned to accomplish development, deployment and installation of the change. The CCR will then be forwarded to M&O to initiate the change. The M&O CCB will also status and report the progress of the CCR/ECO/DCN closure actions.

If any proposed change results in a cost and/or schedule impact exceeding the M&O CCB level of authority, or involves a change to System Level 3 requirements or external interfaces, the Class 1 CCR will be forwarded to the ECS CCB for adjudication. If the M&O CCB determines that a CCR should be considered for incorporation into a future ECS System Release, the M&O CCB submits the CCR to the EDF or SCDV CCB for adjudication.

A more detailed description of these activities can be found in the PI MO-1-003, ECS SDPS Sustaining Engineering and Maintenance Management, WI MO-1-003-4, ECS Deployment IPT Instruction, WI MO-1-003-6, DAAC Help Desk Support, and WI MO-1-007-1, Problem Review Board.

#### **4.6.3 Development, Deployment and Installation of Changes**

ECS sustaining engineering develops or procures COTS proposed changes and tests the changes within the current operational baselined configuration at the EDF test facility. In addition to coordinating patch content and schedule as members of the Deployment IPT, ECS sustaining engineering provides the installation instructions, configuration baseline changes, and requirements/design documentation changes.

After ECS CM ships the approved patch to the SMC, the SMC tracks the status of the installations performed by the DAAC. The DAAC changed configuration baseline and installed status is then updated in the ECS Baseline, and the DAAC notify ECS of the installed status so that the ECO can be closed.

A more detailed description of these activities can be found in the PI MO-1-003, ECS SDPS Sustaining Engineering and Maintenance Management, WI MO-1-003-4, ECS Deployment IPT Instruction, WI MO-1-003-6, DAAC Help Desk Support Work Instruction, and WI MO-1-007-1, Problem Review Board.

#### **4.6.4 Operations Configuration Baseline Maintenance**

Configuration change control administers the actions of the M&O CCB to include recording, statusing and reporting progress of the CCR, ECO, DCN, and action items.

Configuration change control maintains the master copy of the ECS Configuration Baseline database. The database contains the current change status for all CI including “approved/shipped” and “installed” states.

Configuration change control also performs and reports status of periodic configuration baseline verifications and audits performed in the EDF test environment and at the DAAC.

#### **4.6.5 DAAC Unique Extensions (DUE)**

The DAACs identify and develop site unique changes to their DAAC baselines in the form of DAAC Unique Extensions (DUE) and provide required information to the M&O CCB via CCR. A DUE can include HW additions and re-configurations, OS re-configurations, database modifications, COTS configuration changes, and SW additions/ reallocations to the baseline. The M&O CCB reviews the DUEs for potential impact to the ECS Configuration Baselined System and for potential inclusion in the ECS Baselined System. If warranted, the M&O CCB authorizes inclusion in the ECS Configuration Baselined System. The M&O CCB forwards DUEs that are recommended for baseline inclusion but are out of scope of the ECS contract to the ERB for ESDIS consideration.

## 5. Baseline Management

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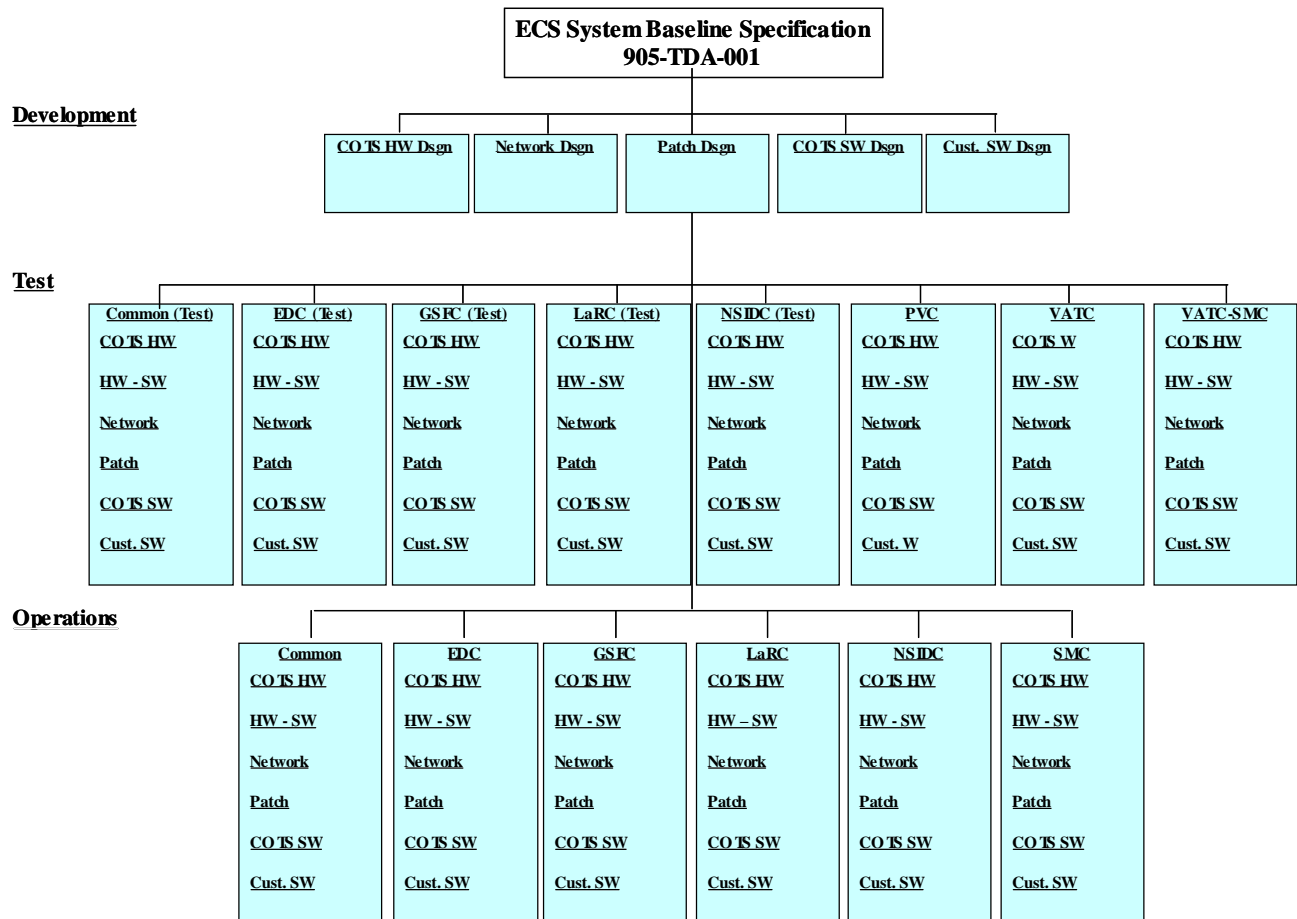
### 5.1 Baseline Management

Although ECS consists of a number of phased releases and each release is identified by a particular baseline, the processes and policies described in this plan are consistently applied. Integral to all project activities is the establishment, maintenance, and supporting documentation of the baselines. CM has a role in the development, test, system acceptance, and operations activities for managing each baseline established throughout the project life cycle. Baselines include necessary descriptive information on Release hardware, software, and procedures. The initial development and deployment process culminates in the installed baseline for the first Release, which had been established during the Development Phase and transferred to M&O as the Operations Baseline at CSR/RRR. Subsequent ECS Releases are identified and defined by approved modifications, additions, and deletions to the baseline for the previous Release, so each successive released baseline is a composite of the new release and the preceding release. Due to the time periods between the Releases, requirement specifications, interface documents, hardware allocations, and other design data can be expected to change. In addition, as changes continue to be approved in the previous Release, they are individually evaluated by the ECS Project's development organizations for applicability to the new Release being developed.

Throughout this process CM establishes procedures to identify the configuration items and to assure that all baseline documentation complies with them. This process ensures that, when delivered, later releases contain all of the applicable fixes and improvements that had been incorporated into predecessor release(s). See Figure 5-1 for a schematic showing the ECS Document Tree.

The ECS System Baseline Specification (905-TDA-001) identifies and defines baseline documentation that describe COTS hardware and software, custom software, firmware, operating systems, software patches and database Configuration Items (CI) in the ECS Science System configuration baselines. The ECS technical documents may be changed only by appropriate CCB and associated Engineer Change Order action resulting from a receipt of an approved CCR.

Configuration change control maintains a listing of technical documents approved by appropriate CCB. This listing is located on the CM web page called ECS Baseline Information System (EBIS). It is an on-line document and data repository for the technical documents. The EBIS is located using the following URL: <http://pete.hitc.com/baseline/> and the mirror site (outside the ECS Firewall) <http://cmdm.east.hitc.com/baseline/index/>.



**Figure 5-1. ECS Document Tree**

Within ECS, Baseline Management includes:

- Managing the identification and documentation of the functional and physical characteristics of a system (configuration identification).

Configuration identification selects and identifies configuration items (**CI**), determines the types of configuration documentation required for each CI, controls technical databases used to describe CI, and establishes baselines.

## 5.2 Configuration Identification

The ECS System Baseline Specification, 905-TDA-001, lays out the overall architecture of the ECS baseline. This specification defines ECS technical documentation used to describe COTS hardware and software, custom software, firmware, operating systems, software patches and database items that are included as CI in the ECS configuration baselines.

The ECS Configuration Baseline may be changed by introduction of a new baseline associated with a new System Release at a CSR or through changes accompanying system patches at PSR.

### **5.2.1 Baseline Identification**

There are three major baselines for ECS:

- Development
- Test
- Operations

The appropriate CCB is responsible for controlling and managing baselines as directed by ECS management. Technical Baseline Documentation is subject to formal configuration control. CCR identifying baselines are identified as such and the baseline is posted on the CM web page (EBIS). Formal configuration identification, status accounting and verification are applied to all ECS configuration items.

### **5.2.2 Identification of Configuration Items (CI)**

CM ensures that there are unique identifications for each configuration item. The current baseline configuration of each ECS CI is reported in the ECS Baseline Information System. Refer to PI CM-1-042, Configuration Identification for more information on how configuration items are uniquely identified.

#### **5.2.2.1 Custom Software**

Custom software CIs are first identified in the DID 305, Release Segment/Design documentation. CM ensures the identification of custom software by unique version identifiers in the development baseline. Embedded Version Information shall include, at a minimum:

Version Identifier (e.g. 6A.03)

Build date/time

Configuration Specification

View used for build

Versioning information is automatically embedded within the CLEARCASE Configuration Specification.

#### **5.2.2.2 COTS Software**

All COTS software products are formally identified and mapped to their software CIs in the DID 305 series design document. COTS product requirements in the ECS are documented in approved specifications by the responsible development organization. Detailed specifications and complete historical change data accompany deliveries from COTS vendors. COTS software modified by the vendor is delivered with addendum documentation describing the changes from

the off-the-shelf product. COTS software modified by ECS development organizations is also documented by addendum documentation as necessary to define the changes from the off-the-shelf product. Configuration files developed for COTS software are treated as developed code and are maintained by Custom Software CM.

The ECS COTS software Librarian disseminates authorized COTS Software for the ECS Project from the start of integrating a Release, testing, and deployment to the DAACs. PI CM-1-043 defines ECS COTS Software Library Maintenance, WI CM-1-043-1 defines ECS COTS Software Library Activities, WI CM-1-043-2, defines COTS Tar File Verification, Preparation, Distribution, and Archiving Procedures.

### **5.2.2.3 COTS Hardware**

The ECS Project has no custom hardware. The configuration identification of COTS hardware is defined by its governing DID 305, Release Segment/Design documentation similar to ECS developed software CI. CM ensures the identification of COTS hardware products by referring to the Host Naming Convention: 905–TDA–002.

### **5.2.3 Documentation**

ECS developed documentation includes requirement specifications, interface requirement documents, design specifications, interface control documents, detailed CI design specifications and drawings.

The configuration identification of each ECS product is defined by a hierarchical set of formal documents, drawings, or listings that define the product within the framework of form, fit, and function.

Formal documentation includes requirements specifications, interface requirements documents, design specifications, interface control documents, detailed design specifications, and other supporting programmatic and technical documentation. DMO has custody of all ECS documentation and is responsible for assigning document numbers as required by the GSFC Technical Information Program (TIP) and as described in PI DM-1-002, Data Identification Numbering. DMO maintains the identification (current and historical) of controlled documents.

### **5.2.4 ECS Requirements**

Requirements are maintained under configuration change control in the Verification Database (VDB). This database provides traceability of parent-child relationships and allocation of requirements to releases. Instructions on the use of requirements management is found in PI SE-1-023 Verification Database Change Control Process.

## 6. Audit Management

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### 6.1 Audit Management

Configuration auditing is the means by which management ensures that both the technical and administrative integrity of the product are being met throughout the Project development life cycle. The audit process consists of formal audits coordinated by CM in conjunction with ESDIS. During these audits all differences between the baseline configuration and “as built” configuration are documented.

Configuration audits are conducted to assure the integrity of the physical configuration and functional configuration. These audits are the Physical Configuration Audit (PCA) and Functional Configuration Audit (FCA) respectively.

Audits are a prerequisite to formal approval of the "as-built" configuration. Audits provide verification that each CI in the baseline being shipped is logically related to the corresponding CI in preceding baselines, and validate that the baseline meets requirements.

Post-audit metrics are developed outlining the specific items audited, audit findings, and corrective actions to be taken. All items are tracked to closure by ECS CM.

#### 6.1.1 Physical Configuration Audits

PCA is a formal assessment of the “as built” configuration to assure that it conforms to the approved baseline as described in the technical documentation package. A project-wide team led by CM conducts the PCA. The team includes representatives from ESDIS.

PCAs are conducted against COTS software, OS Patches, custom code and configuration parameters. These audits employ automated scripts to compare DAAC configurations against baseline documentation. To ensure accuracy of the baselines and compliance to the baseline, differences will be reported, analyzed, and resolved by correcting the baseline documentation (via CCR/ECO/DCN) or correcting the DAAC configuration.

All differences between the audited configuration and the final tested configuration are documented and recorded as NCRs.

#### 6.1.2 Functional Configuration Audit

FCA is a formal audit of test results to assure that each ECS product meets its specified performance requirements to the extent determinable by testing. The Quality Assurance Office conducts this with CM assistance in accordance to PI CM-1-036.



### **6.1.3 Audit Process**

See PI CM-1-009, Physical Configuration Audits for detailed explanation of the process followed for ECS configuration audits.

## 7. Custom Software Configuration Management

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Software configuration management consists of identifying the custom software configuration, controlling custom documentation and code, generating management records and status reports on custom software, storing, handling, and delivering the custom software, and auditing all versions to be released.

A post-audit report is written outlining the specific items audited, audit findings, and corrective actions to be taken. All action items are tracked to closure.

### 7.1 Controlled and Release of Custom Code Software

The environment for control and release of custom code is a hierarchical library maintained using the ClearCase tool. ClearCase provides capabilities for simultaneously managing different patches, releases, and versions of ECS software. The process may be explained by decomposing it into phases:

- EDF activities, where the software is developed. For description of these activities refer to 308-CD-001, Software development Plan. See paragraphs 7.1.1, 7.1.2, 7.1.3.
- Turnover and the delivery of patch / release. See paragraph 7.1.4.
- Acceptance of the delivery for test or operations. For description of these activities refer to 409-CD-600, ECS Overall Acceptance Test Plan and 601-CD-001, Maintenance and Operations Plan. See paragraphs 7.1.5.

Custom Software CM maintains and controls the central repository for custom software files for ECS development and operations. The procedures for the backup of ClearCase VOB data are found in WI CM-1-014-1, Archiving Procedures for ClearCase and are used by Software CM.

#### 7.1.1 Development Environment

The ClearCase developmental environment is based on two fundamental concepts: a baseline “branch” and development of maintenance “tasks” performed offline that involve changing code. Procedures used to develop software using ClearCase are found in WI CM-1-016-1, Software Development Using ClearCase.

#### 7.1.2 Merge

Applications code, which is developed for ECS, is required to be uniquely identifiable for each generation of an executable. This is accomplished through the versioning process that is described in PI CM-1-031, Developed Application Versioning and further explained in WI CM-1-031-1, Developed Application Versioning.

ECS custom software baselines are used for integration testing in integration labs. Changes to the baseline are carefully controlled in accordance with direction received from ECS

management. Once approved Custom Software CM personnel assist developers in the merge of new tasks into the baseline using the ClearCase tool. See PI SD-1-028, ECS Merge Process and WI CM-1-023-1/a, Software Build Process Using ClearCase.

Once a merge has been completed, developers update the state of all appropriate NCRs to 'Test' in DOTS. Concurrently Custom Software CM personnel report completion of the approved merge by e-mail.

### **7.1.3 Baseline Patches**

#### **7.1.3.1 Development and SVAT Phases**

When ECS managers determine that specific computer software units have completed the required code and unit testing and integration and test a software turnover process will be initiated. This process requires that:

- Development presents the material for turnover
- CM assesses its completeness
- Installation team assures that installation can be accomplished
- System Engineering agrees that testing is sufficient, and
- Quality Assurance agrees with the maturity of the patch.

This process is accomplished by completion of a software turnover form (STF). When this process is in place a CCR is prepared for the Turnover to Test.

#### **7.1.3.2 M&O Phase**

Refer to section 4.6.

#### **7.1.4 SMC Activities**

SMC personnel are responsible for collecting and disseminating information on patches as well as future releases. This information is collected and provided to DAAC in advance of delivery. Once the patch is ready, CM will notify the SMC that the files are ready and provide the location and description of the files. See WI DP-1-001-1, Code Drop Staging and Delivery Procedures for a description of this process.

CM will prepare release notes for all patches. These notes will describe the patch being delivered and will contain other information tailored to the specific delivery.

#### **7.1.5 Release**

ECS versions are turned over to the Government at specific milestone events. Turnover activities follow the precedent of patch releases and are accomplished at Release Readiness Reviews. Prior to RRR draft Version Description Document (VDD) that describes the custom

code to be released are prepared. This document describes the version being delivered, provides an inventory of all custom and COTS included in the version, build instructions, installation instructions, and other supporting documentation. See PI CM-1-020, Version Description Document (VDD) Preparation Guidelines which outlines the procedure for all software releases. Final delivery of the VDD will take place at RRR + 30 days.

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# Abbreviations and Acronyms

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CCB	Change Control Board (Raytheon Systems Company Convention) or Configuration Control Board (NASA Convention)
CCR	Configuration Change Request
CDMTS	Configuration/Data Management Tracking System
CDRL	Contract Data Requirements List
CI	Configuration Item
CM	Configuration Management
COTS	Commercial off the Shelf
CSA	Configuration Status Accounting
CSR	Consent to Ship Review
DAAC	Distributed Active Archive Center
DCN	Document Change Notice
DDTS	Distributed Defect Tracking Software
DID	Data Item Description
DM	Data Management
ECO	Engineering Change Order
ECS	EOSDIS Core System
EDF	ECS Development Facility
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
ESD	Engineering Support Direction
ESDT	Earth Sciences Data Type
FCA	Functional Configuration Audit
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
I&T	Integration and Testing

IPT	Integrated Product Team
M&O	Maintenance and Operations
NASA	National Aeronautical and Space Administration
NCR	Nonconformance Report
NRCA	Nonconformance Reporting and Corrective Action
PCA	Physical Configuration Audit
PCMB	Program Control and Management Board
PI	Project Instruction
PSR	Pre-Ship Review
PVC	Pre-Release Verification Center
QO	Quality Office
ROM	Rough Order of Magnitude
RRR	Release Readiness Review
RSC	Raytheon Systems Corporation
SD	Science and Development
SDL	Software Development Library
SDPS	Science Data Processing Segment
SMC	System Monitoring Center
SS	Science Systems
STF	Software Turnover Form
TIP	Technical Information Program
TT	Trouble Ticket
VATC	Verification and Acceptance Test Center
VDB	Verification Database
VDD	Version Description Document
VOB	Version Object Base
WI	Work Instruction